



Histologic Alterations in Salivary Glands Post Fine Needle Aspiration Cytology – A Diagnostic Challenge

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ABSTRACT

Fine-needle aspiration (FNA) is used widely in the initial workup and diagnosis of both palpable and deep-seated masses. Salivary glands are among the most commonly aspirated locations in the head and neck area. Fine-needle aspiration cytology (FNAC) is a simple, safe and non-invasive ancillary diagnostic method that is relatively atraumatic. However, it can lead to histologic changes that may obscure the underlying pathology or mislead the unwary to render an erroneous diagnosis of malignancy. The tissue changes after FNAC include haemorrhage, squamous cell metaplasia, infarction and necrosis and needle track tumour seeding. Although tissue changes induced by FNAC are rare and account for only 7% and 10 % cases, awareness of these alterations will prevent the pathologist from overestimating the diagnosis. The aim of this review is to emphasize the importance of recognizing the histologic changes induced by FNAC and of obtaining the clinical history of a preoperative FNA procedure to avoid potential misdiagnosis.

Key Words: Breast, Cytological techniques, Hemorrhage, Infarction, Lymph nodes, Metaplasia, Necrosis, Neoplasms, Salivary glands, Thyroid gland

INTRODUCTION

Fine Needle Aspiration Cytology (FNAC) is the most commonly used diagnostic tool in salivary gland lesions.¹ FNAC was introduced as a diagnostic tool by Martin and Ellis in the 1930s. Between the 1950s and the 1960s, Eneroth et al. developed FNAC of salivary glands.² It is a simple, safe and well tolerated diagnostic procedure. It is widely employed as an initial triage procedure to identify those lesions that are likely to be neoplastic and thus require surgical excision.³ It can also be used as a complement with intraoperative frozen section to help define the extent of initial surgery.⁴ The thyroid, salivary gland, lymph node and breast are the most commonly aspirated sites.³

Prior to implementing a specific treatment plan, FNAC is used to obtain a preliminary diagnosis regarding the nature of the disease process and to confirm that the swellings are indeed preauricular and submandibular lymph node swellings,

as they can clinically resemble salivary gland neoplasms. Diagnostic accuracy as reported with FNAC is 80%-90%.¹

FNAC is considered a relatively atraumatic procedure but can lead to histologic changes in the tissue that may obscure the underlying pathology or mislead the unwary to render an erroneous diagnosis of malignancy. It is important to be familiar with the spectrum of histologic changes induced by FNA to avoid misdiagnosis. The aim of this review is to emphasize the importance of recognizing the histologic changes induced by FNAC and of obtaining the clinical history of a preoperative FNA procedure to avoid potential misdiagnosis.

Diagnostic Value of FNAC

FNAC is a simple, inexpensive, easily performed outpatient procedure which can provide a rapid diagnosis. It is a technique which is safe, rapid, relatively pain free, cost effective and accurate.⁵ It is used as an adjunct to tissue biopsy. It is always a clinician's first choice.⁶ Fine-needle aspiration is a

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useful diagnostic and screening tool to aid in preoperative management and to avoid unnecessary surgical procedures in patients with palpable superficial and deep-seated lesions in a variety of tissue. Aspiration cytology is frequently utilized for diagnostic purposes and when needed, can be used therapeutically to drain benign cysts. There is evidence that employing FNA early on in the diagnostic work-up of patients can help avoid unnecessary surgery.⁷

Role of FNAC in suspected salivary gland lesions is to confirm the origin and provide a preliminary diagnosis about the nature of the disease process for definite management plan. FNAC helps in distinguishing between neoplastic and non-neoplastic, benign and malignant, high- and low-grade lesions.⁸

Histological changes caused by FNAC

FNAC can cause variable degrees of tissue injury. These tissue injuries are reported in literature in various tissues such as thyroid, breast, lymph node and salivary gland.⁹ The reported incidence of histopathological alterations in salivary glands ranges from 7% to 10%.¹⁰

The various histological alterations induced by FNAC include Haemorrhage, Squamous Metaplasia, Infarction and Necrosis.³ Fibrosis and cystic degeneration are other histologic changes that have been considered as complications of FNAC.¹¹ The parotid gland was the location most frequently involved by tumor, both benign and malignant, as well as the location demonstrating the highest number of FNA-related tissue changes.¹⁰

Haemorrhage

Haemorrhage is the most common complication of FNA. Extensive haemorrhage may cause difficulties in rendering a diagnosis as it obscures the diagnostic features. Additionally, it may lead to over diagnosis as haemorrhage is a frequent finding in malignant neoplasms.³ FNAC causes direct traumatic injury to the vascular supply leading to disruption of blood flow to the tumor.

Studies by various authors have reported the frequency of hemorrhage to vary from 10 to 70%.^{9,10} The hemorrhage reported varied from focal, minor hemorrhage to those involving large sites obscuring the histological features making it difficult to arrive at a definitive diagnosis.

Squamous Metaplasia

Squamous metaplasia and keratin pearl formation have been reported in salivary gland lesions secondary to FNAC. Squamous metaplastic changes seen in benign salivary gland tumors might lead to over diagnosis as malignant neoplasms probably high grade mucoepidermoid carcinoma and squamous cell carcinoma. The probable reasons are the squamous cells often reveal nuclear atypia and the scanty mesenchymal

component. This may have direct effect on preoperative and intra operative surgical planning in surgery of the tumors.¹² Lack of cytologic atypia in metaplastic epithelium and correlation of surgical material with FNA cytology should lead to the correct diagnosis.^{3,13} According to Li et al. (2000), 80% of cases exhibit squamous metaplasia in salivary gland tumors.¹⁴

Tissue Infarction and Necrosis

Complete or partial infarction of tumors and lymph nodes have been reported to occur as a result of FNAC.¹⁵ Partial or near total necrosis and infarction during FNAC can occur due to various reasons such as direct trauma or injury, introduction of infection in the tumor or when more than one attempts are made for the aspiration. FNAC may cause hemorrhage which leads to increased intralesional pressure in the tumor causing compression on blood vessels which in turn leads to ischemia and tumor infarction.¹⁶ According to Mukunyadzi et al. (2000), Surgical evaluation of the resected material showed that varying degrees of infarction can be seen in 7% of cases. Most malignant neoplasms of salivary glands exhibit necrosis. It is an important criterion for grading of salivary gland neoplasms. Presence of necrosis can lead to over diagnosis of malignant neoplasm.

DISCUSSION

Histological changes post FNAC were classified by Batsakis in three categories-

Micro-necrosis,
Hemorrhage with
retention of diagnostic
features

Macro-necrosis with
deletion of diagnostic
features

Macro or sub-macro
necrosis with reactive
proliferation of neoplastic
and stromal cells

Most changes belong to the first category of Batsakis's classification.¹⁶ Occasionally, the changes almost completely obscure the underlying cells of the lesion, making the diagnosis difficult, if not impossible. These histological alterations may lead to over or under diagnosis of the tumor (Figure 1).

Histological alterations secondary to FNAC can be minimal when very fine (23- to 25-gauge) needles are used and they do not preclude histologic diagnosis on subsequently excised specimens.¹⁰ Ultrasonography guided FNAC can be the safe alternative in avoiding the potential injuries to the blood vessels and thereby reducing these alterations.

CONCLUSION

Histological alterations accounts for 7% and 10% cases, awareness of these tissue changes induced by FNAC among the pathologists can prevent them from overestimating the diagnosis. This review emphasizes the importance of recog-

nizing the histologic changes induced by FNAC and of obtaining the clinical history of a preoperative FNA procedure to avoid potential misdiagnosis.

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Authors' Contribution:

S No	Author Name	Credit author role in manuscript
1.	Dr Vaishali Sadhwani	Methodology, Software , Data Curation, Writing- Original Draft
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3.	Dr Pradeep GL	Validation, Writing-Review and Editing, Project Administration
4.	Dr Nilima Prakash	Writing-Review and Editing, Visualization, Formal Analysis
5.	Dr Aarti Mahajan	Visualization, Supervision
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